UHF FM TRANSCEIVER
PX-666

SERVICE MANUAL

----------CONTENTS----------

INTRODUCTION……2
GENERAL 2
CIRCUIT DESCRIPTION 3-8
TECHNICAL SPECIFICATION ..... …9
SOFTWARE FUNCTION SPECIFICATION……10
SEMICONDUCTOR DATA..... 11
PARTS LIST.....12-16
BLOCK DIAGRAM …… 17
PCB BOARD……18-19
SCHEMATIC DIAGRAM..... 20-22

INTRODUCTION

SCOPE OF THIS MANUAL

This manual is intended for use by experienced technicians familiar with similar types of commercial grade communications equipment. It contains all required service information for the equipment and is current as of the publication data. Changes which may occur after publication are covered by either Service Bulletins or Manual Revisions. These are issued as required.

ORDERING REPLACEMENT PARTS

When ordering replacement parts or equipment information, the full part identification number should be included. This applies to all parts : components, kits, or chassis. If the part number is not known, include the chassis or kit number of which it is a part, and a sufficient description of the required component for proper identification.

PERSONNEL SAFETY

The following precautions are recommended for personnel safety:
DO NOT transmit until all RF connectors are verified secure and any open connectors are properly terminated.
SHUT OFF and DO NOT operate this equipment near electrical blasting caps or in an explosive atmosphere.
This equipment should be serviced by a qualified technician only.

SERVICE

This radio is designed for easy servicing. Refer to the schematic diagrams, printed circuit board views, and alignment procedures contained within.

GENERAL

Your Transceiver is an electronic product of exact design and should be treated with care .The suggestions below will help you to fulfill any warranty obligations and to enjoy this product for many years.

- Do not attempt to open the unit. Non-expert handling of the unit may damage it.
- When using regulated power supply, take notice of power voltage must be between 6V and 8V to avoid damaging the unit.
- Do not store the Radio under the sunshine or in hot areas.
  High temperatures can shorten the life of electronic devices, and warp or melt certain plastics.
- Do not store the Radio in dusty, dirty areas
- Keep the Radio dry. Rainwater or damp will corrode electronic circuits.
- If it appears that the Radio diffuses peculiar smell or smoke, please shut off its power immediately and take off charger or battery in the Radio, then contact with PUXING agency.
- Do not transmit without antenna.

CIRCUIT DESCRIPTION

1.FREQUENCY CONFIGURATION

The frequency configuration is shown in Figure 1

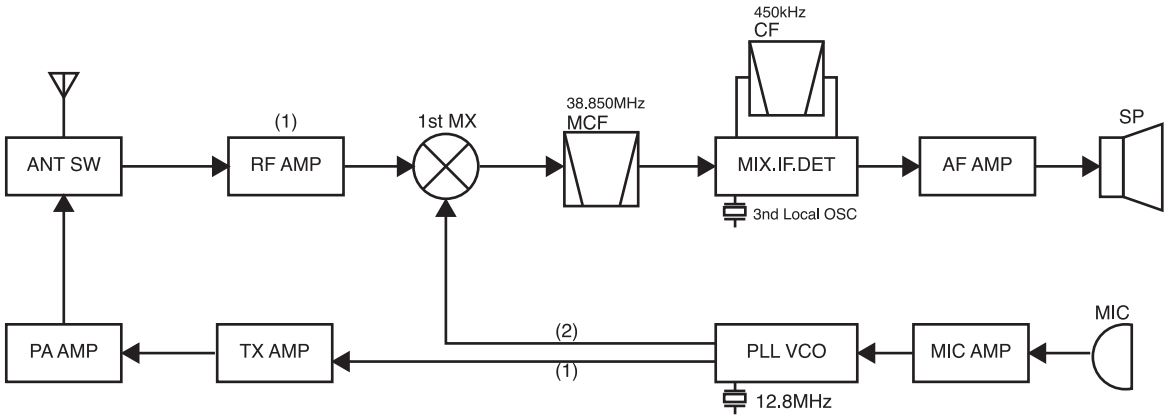


Fig.1

2.RECEIVER SYSTEM

RF amplifier

The signal from the antenna is passed through a low-pass filter and the transmission/reception selector circuit D151, D152 input to the RF amplifier.The input signal is amplifier by T203. The unwanted frequency band of the signal is then eliminated by a band-pass filter.

First-stage mixer

The input signal is mixed with the first local oscillator signal from the PLL circuit by the first-stage mixer T202,producing a first IF signal. The unwanted frequency band of the first IF signal is eliminated by a crystal filters

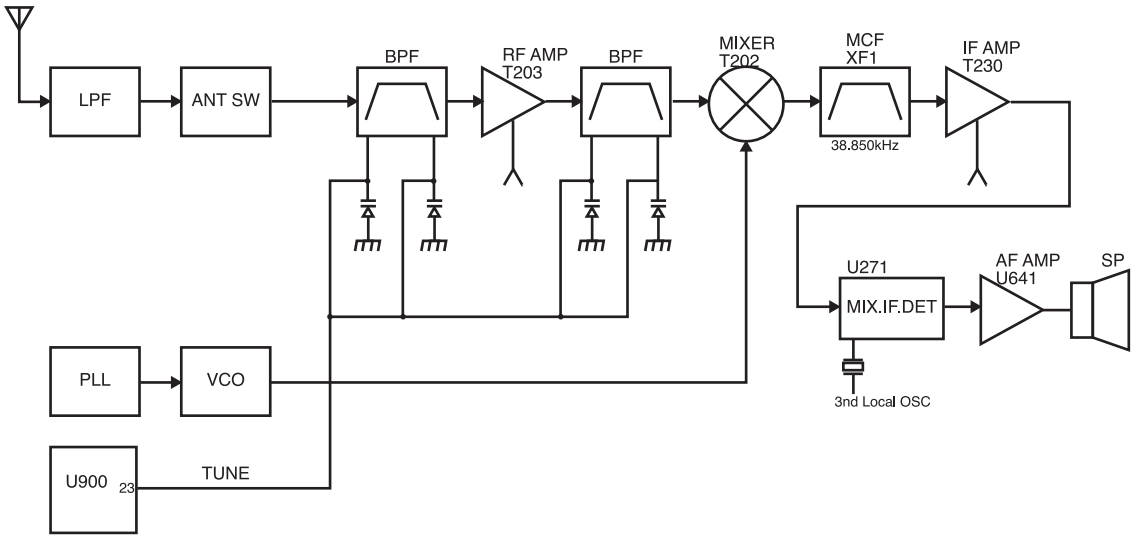


Fig.2

IF amplifier

The first IF signal is amplified by T230 and enters U271(FM signal processing IC),where it is mixed with the second local oscillator signal and so converted into the second IF signal. The unwanted frequency band of the second IF signal is eliminated by ceramic filter FL251. The resulting signal is then amplified and detected.

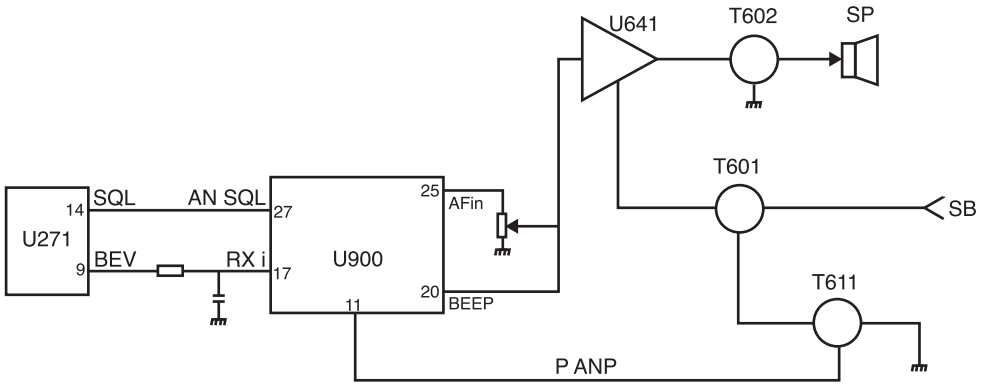


Fig.3

AF amplifier

The audio signal output by the FM detector are corrected by the high-pass filter and de-emphasize circuit. The audio signal is then passed through and AF variable resistor and amplified by power amplifier U641 to obtain the desired output.

Squelch and mute circuits

The output detected by U271 is input to MCU(pin 26), the voltage input to the microprocessor is digitized, and the microprocessor controls the MUTE.,RXI,RXO, thus controlling the audio signal. The microprocessor control this system from level 1-9, it can be programmable by software or keypad.

3.TRANSMITTING SYSTEM

Microphone amplifier

The audio band of the signal from the microphone is corrected by preemphasis circuit The signal is amplified and limited by U401B(1/2). Distortion components exceeding the audio band of the resulting signal are then eliminated by a splatter filter consisting of U401A(2/2).

Modulation circuit

The signal from the microphone amplifier passes through the modulation adjustment variable resister VR451, is applied to VCO varicap diode D312, and modulated by variable reactance.

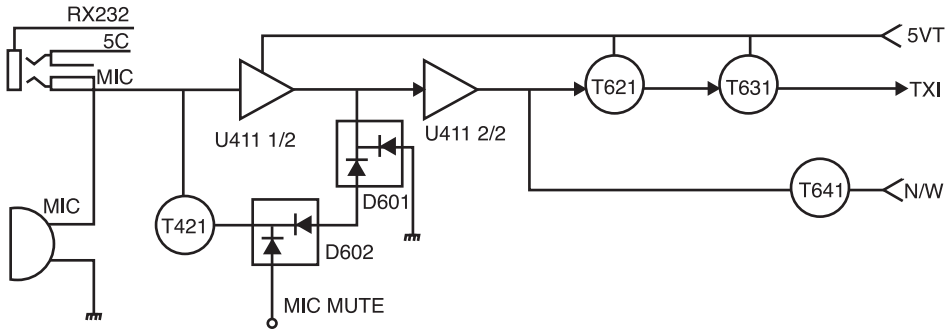


Fig.4

Drive and Final Circuit

The desired signal is produced by the VCO, and amplified by T101. It is then amplified by T102. The amplified signal is input to a twostage FET amplifier, and increases the power to about 4W.

Transmission/reception selector circuit

The transmission output is passed through the transmission/reception selector circuit and low-pass filter to the antenna. The transmission/ reception selector circuit, which consists of D140,D151 and D152,is turned on during transmission and off during reception to switch the signal.

APC and transmission output selector circuits

The automatic power control(APC) circuit is used to obtain a stable transmission current. This circuit detects the drain current in the final stage of the power module and controls the transmission output. For U170, two voltages are applied: one is the reference voltage for transmission output adjustment, another is the detection voltage generated across R130,R132 in proportion to the drain voltage in the final stage. The voltage, proportional to the difference between the reference voltage and the detection voltage, is obtained at the output of U171. This voltage is reversed by T181 to provide the APC voltage. This APC voltage controls the power control pin of the power module and stabilizes the transmission output. Output power can adjusted by PC software or by manual.

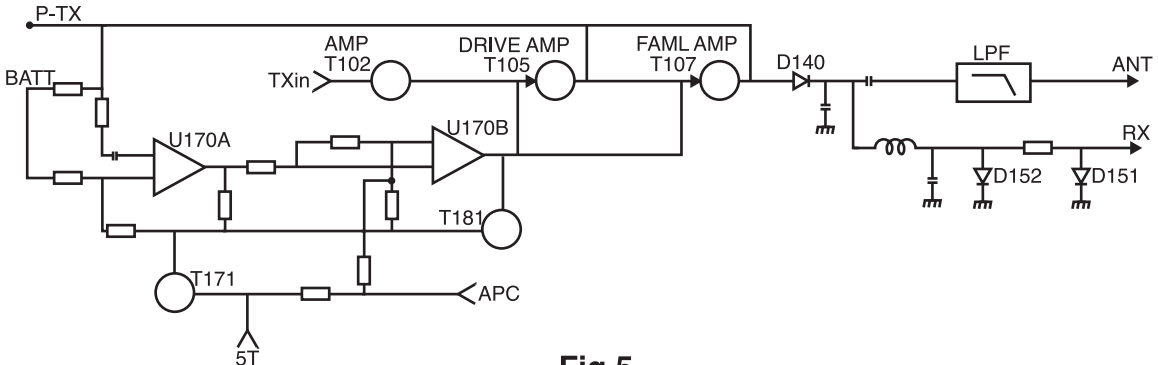


Fig.5

4.PLL CIRCUIT

PLL

The output from the 12.8Mhz reference oscillator is divided by U361 to produce a 5 kHz or 6.25Khz reference frequency. The comparison frequency is obtained by amplifying the VCO output by T140 and dividing it by the U361. 5,10,12.5,20, and 25Khz PLL synthesizer is implemented by phase-comparing the reference frequency and comparison frequency obtained when CR311 is divided. The pulse output from Pin 5 of U361 according to the difference between the reference frequency and the comparison frequency is passed through the charge pump. And is removed the ripple by a low-pass filter to produce the lock voltage.

VCO

The desired frequency is directly produced by the Colpitts oscillator configured around FET,T330, and 310. The lock voltage is applied to D331, D330,D311 and D310 to change the oscillator frequency.

Unlock detection circuit

When the PLL is in the unlock state, the pulse that is output to the LD pin (pin 10) of PLL is waveform shaped by R413,D401,C407 and R414. The LD pin is then made high. The voltage at the LD pin is monitored by the microprocessor to control the transmission or reception selection timing.

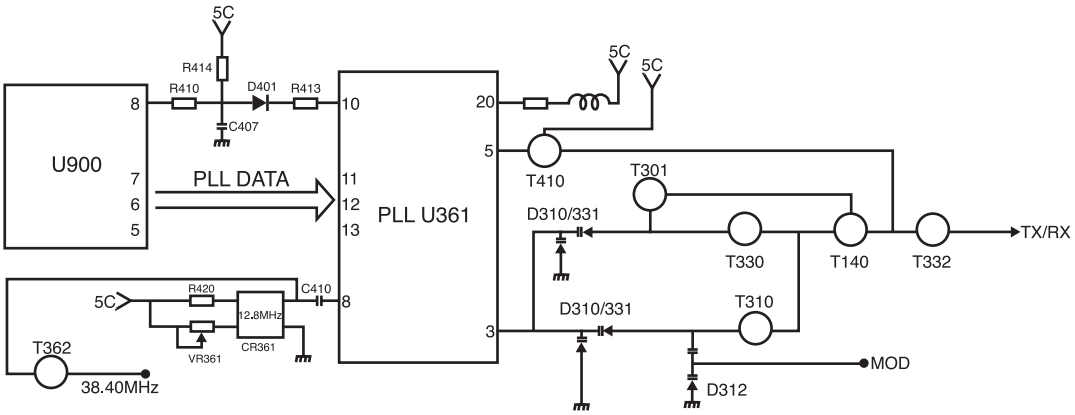


Fig.6

5.DIGITAL CONTROL CIRCUIT

Keys and rotary encoder circuit

The signal from keys and rotary encoder input to microprocessor directly

Reset and backup circuits

When the SB is turned on, a high-level pulse is output from the reset circuit consisting of T901,C904, and R904 to reset microprocessor U900(Pin 32). If SB is turned off, U900 detects a 5V voltage drop, and outputs a low signal. When the microprocessor port goes low, it outputs data to U911 and enters backup mode.

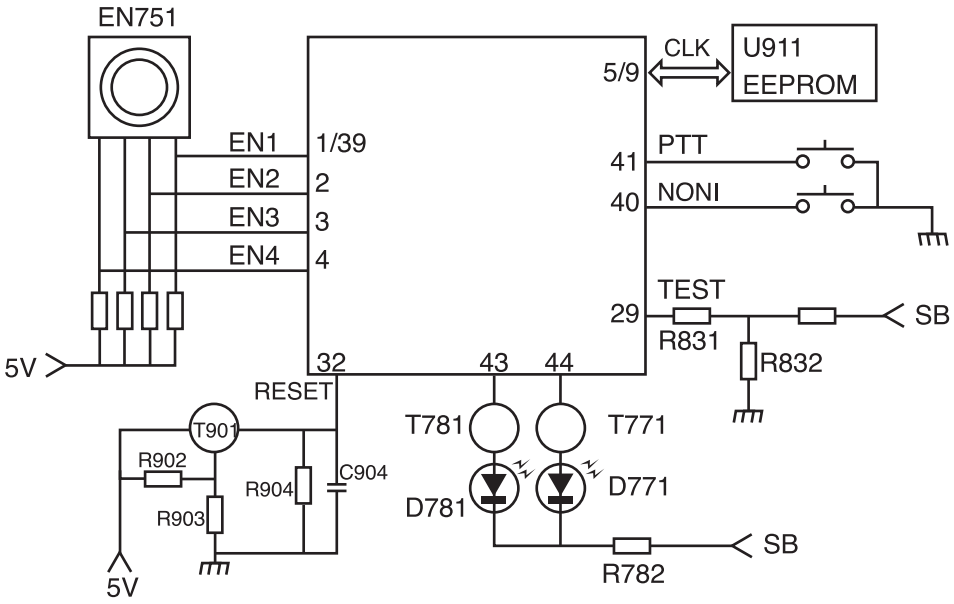


Fig.7

Battery voltage detector circuit

The supply voltage(SB) is divided and input to the analog port(Pin28) of the microprocessor.

Battery save circuit

The squelch is switched in during receive. The power circuit enters battery save mode if no key has bean pressed for five seconds. This circuit is controlled by microprocessor.

POWER SELECTOR CIRCUIT

The power circuit configuration is shown in Figure 8. The power circuit branches are as follows:

BATT
- RB——Power amplifier power supply voltage
- 5M——Output 5M by U830 stabilized voltage circuit,microprocessor U900, Vdd.
- SB
  - ASB——AF amplifier U641,Vdd.
  - Output 5TC by U811 stabilized voltage circuit, P-TX control Transmission voltage output 5VT. P-RX control 5VR supply to receive voltage. T851 control 5VC supply to voltage U361、CR361、U911、GK511.

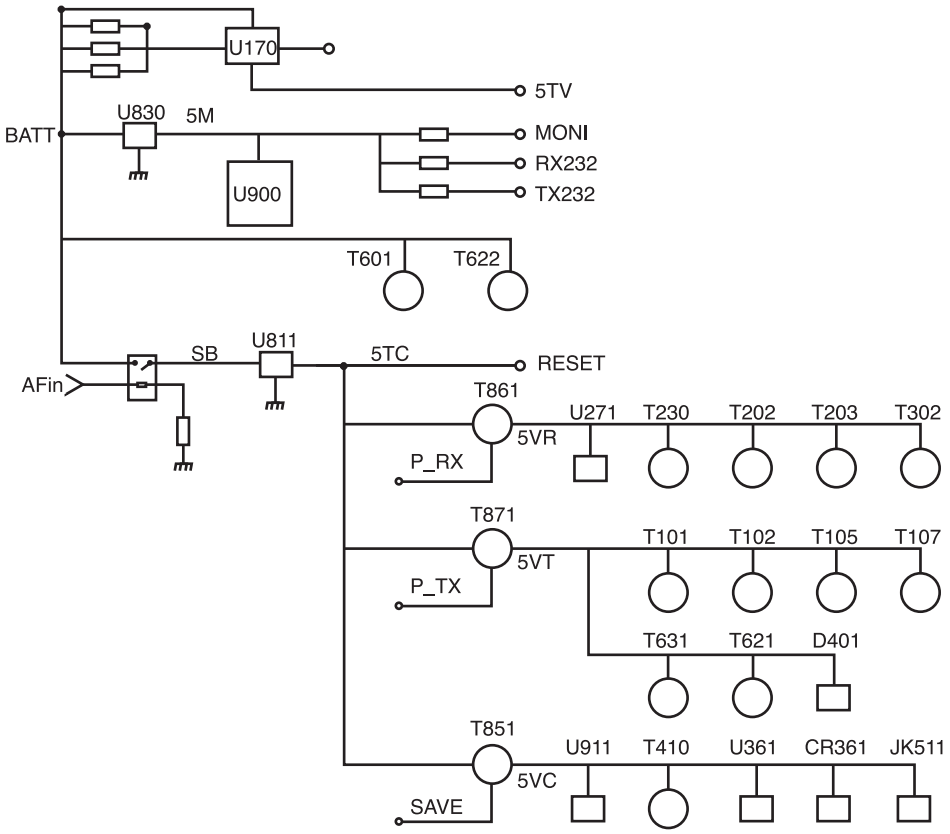


Fig.8

CTCSS/DCS circuit

The sub-tone signal is produced by the serial data from Pin20(CTCSS) or Pin44(DCS) of microprocessor. When the sub-tone is transmitted, the CTCSS /DCS is output from the microprocessor and modulated, after through LPF. The audio signal detected output to the decoder of microprocessor. The DEV pin is made low when the tone frequency coincides. The microprocessor determines the DEV pin state.

Technical specification of PX-666

General

Frequency Range	450-470MHz
Working Temperate	－20℃－＋50℃
Operating Voltage	DC 5.4-6.5V
Operate Mode	Simplex or Semi-duplex
Dimension	102mm×55mm×37mm (Not included Antenna)
Weight with battery and antenna	278g
Antenna impedance	50Ω

Transmitter	
Frequency Stability	±2.5PPM
Output Power	≥4W
Max Frequency Deviation	≦5KHz
Audio Distortion	≦3%
Modulation type	FM
Adjacent Channel Power	≥60dB
Radiated Harmonics:	-45dBm
Frequency error	+196Hz

Receiver	
RF Sensitivity(SINAD)	+14.0dBuV/m
Audio Distortion	≦3%
Adjacent Channel Selectivity	≥60dB
Intermodulation Rejection	≥60dB
Spurious radiation	-63dBm
Spurious response rejection	≥60dB

PX-666

Software Function Specification

Specification

1. UHF 4W output
   UHF: 450-470MHz
2. 16 Channels
3.Wide(25kHz) and Narrow(12.5kHz) selectable
4.Monitor function
5.Power Save function
6.Adjust squelch level(0-9)
7. CTCSS/DCS tone
8.Scan 16th channel
9.Transmitting timer
10.Output power adjustable
11.Reverse frequency simplex
12.CTCSS/DCS selectable

Operation

1. User mode
(1)Normal communicate mode
(2)Manual operation mode
2. It can program the radio by PC software.
(1) programming software
(2) Receiving frequency and transmitting frequency
(3) Receiving tone and transmitting tone
(4) Output power
(5) Time-Out Timer
(6)Squelch level (1-9) selectable
(7)Power save
(8)bandwidth selectable (12.5khz/25khz)
(9)Store channels (16 channels)
(10) Simplex frequency setting
(11) channel step
(12) Scan 16^{th} channel

CPU PIN FUNCTION			PX-666
ITEM	**DESCRIPTION**	**I/O**	**FUNCTION**
1	EN1	I	Encoder input
2	EN2	I	Encoder input
3	EN3	I	Encoder input
4	EN4	I	Encoder input
5	CLK ROM	I/O	CLOCK AND EEPROM
6	CLK PLL	O	CLOCK AND PLL
7	CS PLL	O	CS PLL port
8	LD	O	Unlock Detection
9	DATA ROM	I/O	Data and eeprom
10	MIC MUTE	O	MIC MUTE CONTROL
11	P-AMP	O	Audio amplifier power supply control output
12	NC	-	Non-connect
13	NC	-	Non-connect
14	NC	-	Non-connect
15	AVCC	-	5M Direct Current output
16	RXO	O	IF output
17	RXI	I	IF input
18	NC	-	Non-connect
19	NC	-	Non-connect
20	BEEP/QT	O	BEEP output /CCTCS tone signal output
21	LC	O	Direct current transfer filter
22	AVSS	-	Connect to VSS
23	APC	O	TX:Automatic power/RX: BPT automatic gain output
24	N/W	O	Width/Narrow control
25	ARX	O	Receiver audio output control
26	RSSI	O	Squelch level output control
27	AN SQL	O	Squelch audio output port
28	BATT Test	O	Battery check
29	OSC in	I	Internal oscillator input
30	OSC out	I	Internal oscillator output
31	VSS	-	GND
32	Reset	I	MCU Reset
33	Vdd	I	MCU 5M power input
34	DQT	O	DTC control output
35	SAVE	O	Save function control
36	P-TX	O	Tamsmit control
37	P-RX	O	Receiver control
38	TX232	O	RS-232C PC output
39	EN1	I	Encoder input control
40	MONI	O	"MONI" key input
41	PTT/RX232	I	PTT key /RX232C PC input
42	DATA	O	PLL data output
43	LED G	I	LED green
44	LED R	I	LED red

PX-666 PART LIST

Footprint	Comment	Quantity	Designators						MARK
CAPACITOR									
C0402	0.5P(B)	3	C212	C211	C323				
C0402	1P(B)	6	C306		C149	C201	C205	C151	
				C154					
C0402	1.5P(B)	1	C155						
C0402	2P(B)	2		C209			C200		
C0402	3P(B)	5	C341	C204		C153		C214	C312
C0402	4P	1		C148					
C0402	5P(B)	6	C324	C404	C321	C150	C218	C307	
C0402	6P(B)	4	C345	C136	C213	C202			
C0402	7P(B)	3	C108	VC201	C142				
C0402	8P(B)	2	VC202	VC301					
C0402	10P(B)	2	C302	C322					
C0402	12P	1	C111						
C0402	15P	3	C203	C403	C217				
C0402	18P	1	C135						
C0402	20P	2	C118	C246					
C0402	27P	3	C904	C905	C249				
C0402	47P	1	C432						
C0402	82P	2	C435	C119					
C0402	100P	10	C609	C175	C643		C138	C408	
			C407	C406	C402	C252	C286		
C0402	102P	23	C611	C605	C422	C176	C606	C822	
			C821	C804	C310	C311	C301	C328	
			C116		C123	C208	C210	C206	
			C207	C235	C401	C600	C641	C230	
C0402	103P	36	C922	C923	C924	C925	C881	C610	
			C823	C603	C805	C811	C807	C174	
			C181	C802	C906	C908	C634	C423	
			C431	C434	C233	C343	C326	C320	
			C327	C329	C158	C862	C128	C215	
			C216	C833	R452	C852	C242	C305	
C0402	104P	22	C183	C601	C612	C882	C182	C901	
			C942	C907	C257	C248	C156	C113	
			C131	C421	C405	C243	C241	C240	
			C250	C863	C871	C872			
C0402	105P	1	C941						
C0402	221P	4	C921	C645	C244	C245			
C0402	223P(J)	2	C607	C608					
C0402	224P	1		C256					
C0402	273P	1	C604						
C0402	332P	2	C632	C622					

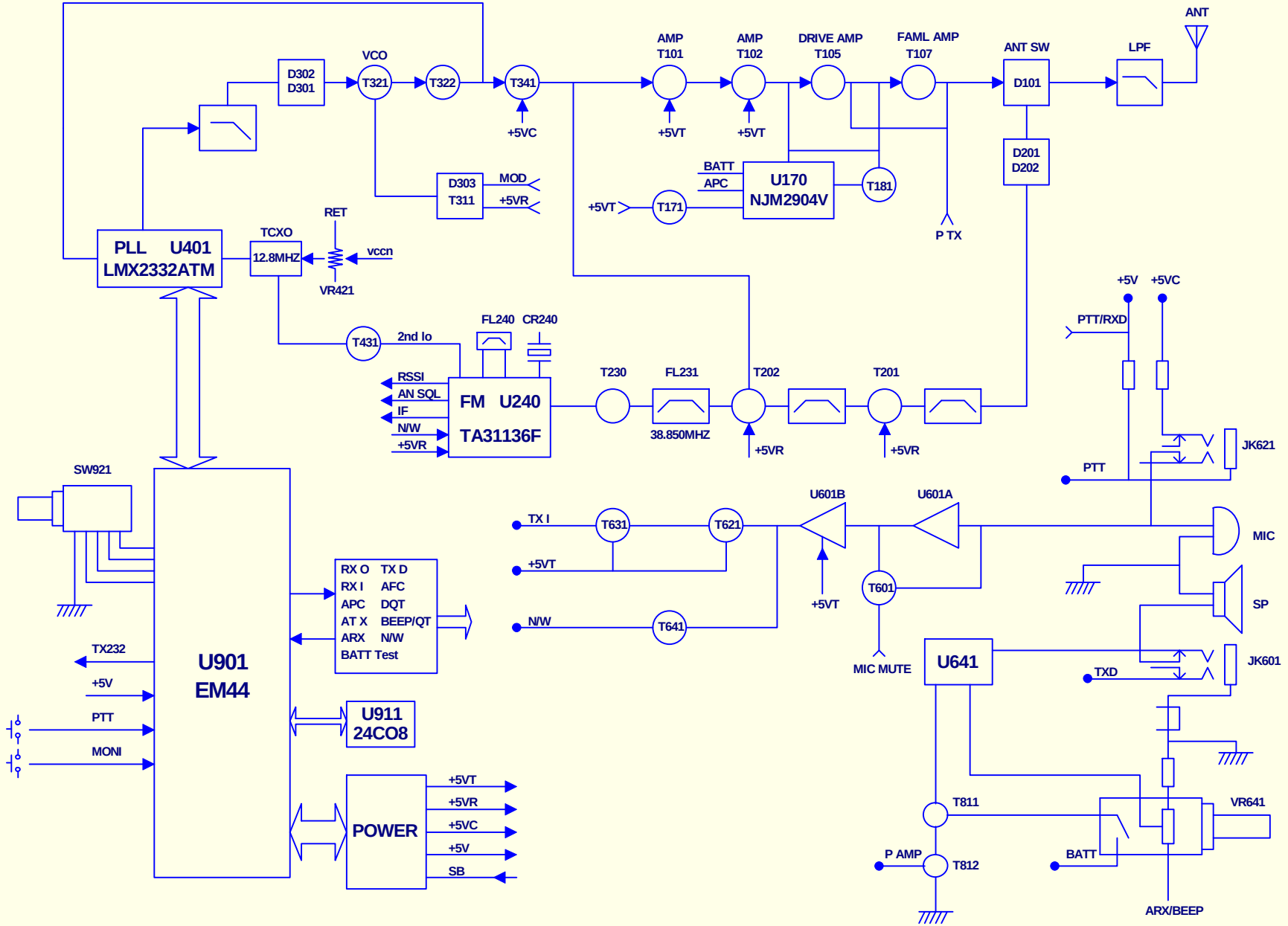
C0402	333P	1	C451						
C0402	390P	1	C433						
C0402	470P	22	C635	C344	C247	C107	C106	C114	
			C157	C110	C109	C121	C143	C129	
			C145	C125	C864	C120	C615	C602	
			C180	C173	C832	C234			
C0402	472P	1	C254						
C0402	473P	3	C631	C621	C644				
C0402	680P	2	C633	C623					
C0603	103P	1	C831						
C0805	20P(G)	1	C130						
C0805	105P	3	C801	C126	C803				
C1206	105P	1	C127						
DIODE									
D_USC	1SV270	3	D301	D302	D303				
D_ESC	HSC277	4	D341	D342	D201	D202			
D_ESC	PMSD4148	2	D401	D320					
D_SMA	1SR145-400	1	D801						
D_USC	MA77	1	D310						
D0603	RED	1	D822						
D0603	GREEN	1	D821						
D0705	HVU131	1	D101						
ELECTROLYTIC									
C型	220uF/6.3V	1	E643						
A型	10uF/10V	6	E281	E601	E831	E240	E321	E642	
B型	22uF/6.3V	2	E404	E832					
C0805	0.1uF/16V	2	E401	E403					
C0805	2.2uF/16V	2	E631	E402					
C0805	4.7uF/10V	6	E602	E180	E422	E443	E603	C304	
C1206	1uF/10V	1	E641						
INDUCTOR									
L0603	2.2nH	1	L119						
L0603	1uH	1	L431						
L0603	15nH	1	L102						
L0603	18nH	3	L208	L101	L341				
L0603	100nH	6	L601	L301	L322	L323	L321	L302	
L0603	100nH	3	L621	L401	L103				
L0603	220nH	2	L901	L903					
L0603	560nH	1	L2						
L0805	100nH	2	L105	L107					
L0805	220nH	1	R655						
L0805	220nH	1	L109						
L1009	1.5uH	1	L209						

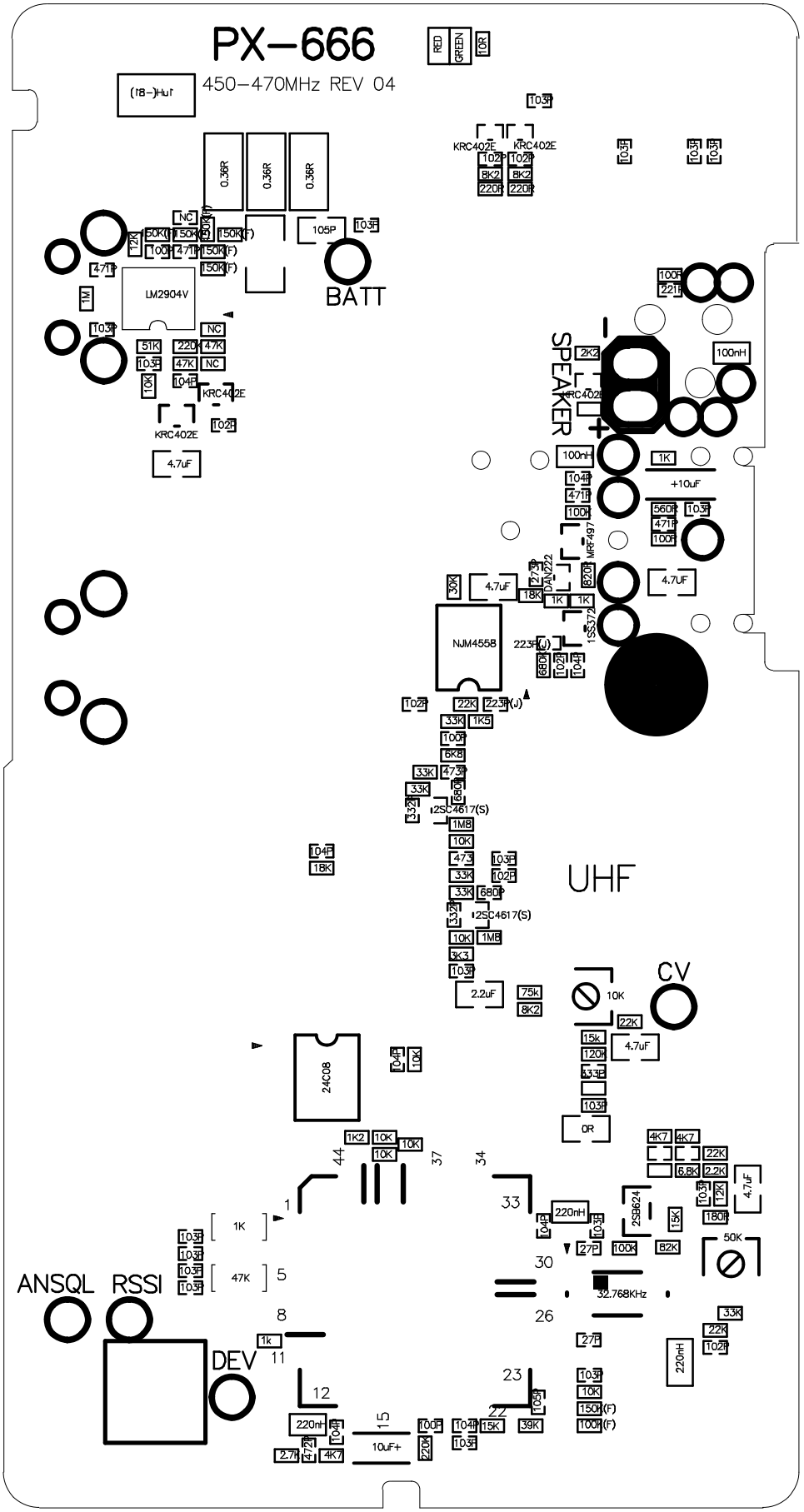
L1009	27nH	1	L320						
L3325	1uH	1	L118						
RESISTANCE									
R0402	0R	5	R120	R200	R406	R346	R401		
R0402	10R	6	R825	R644	R640	R341	R320	R115	
R0402	22R	2	R109	R111					
R0402	47R	2	R121	R128					
R0402	100R	12	R922	R926	R246	R431	R641	R323	
			R321	R921	R209	R204	R240	R640	
R0402	150R	1	R642						
R0402	180R	1	R420						
R0402	220R	3	R822	R821	R202				
R0402	270R	3	R343	R154	R139				
R0402	330R	3	R108	R113	R207				
R0402	560R	2	R602	R405					
R0402	680R	1	R110						
R0402	820R	1	R614						
R0402	1K	9	R612	R613	R601	R905	R234	R208	
			R412	C132	L104并				
R0402	1K2	2	R923	R400					
R0402	1K5	2	R608	R112					
R0402	1K8	1	R402						
R0402	2K2	8	R812	R425	R410	R311	R233	R231	
			R230	C104					
R0402	2K7	1	R245						
R0402	3K3	8	R244	R635	R344	R340	R345	R403	
			R404	R239					
R0402	4K7	7	R444	R445	R248	R324	R872	R249	
			R238						
R0402	5K6	2	R242	R302					
R0402	6K8	3	R610	R447	R638				
R0402	8K2	3	R637	R823	R824				R
R0402	10K	13		R184	R911	R883	R624	R925	
			R924	R927	R310	R432	R811		
			R301		R347	R634			
R0402	12K	2	R424	R177					
R0402	15K	3	R942	R902	R457				
R0402	18K	2	R604	R187					
R0402	22K	6	R605		R423	R451	R305	R411	
			R125						
R0402	30K	1	R607						
R0402	33K	7	R609	R421	R632	R631	R622	R621	
			R636						
R0402	39K	2	R941	R422					
R0402	47K	7	R186	R182	R312	R107	R118	R871	

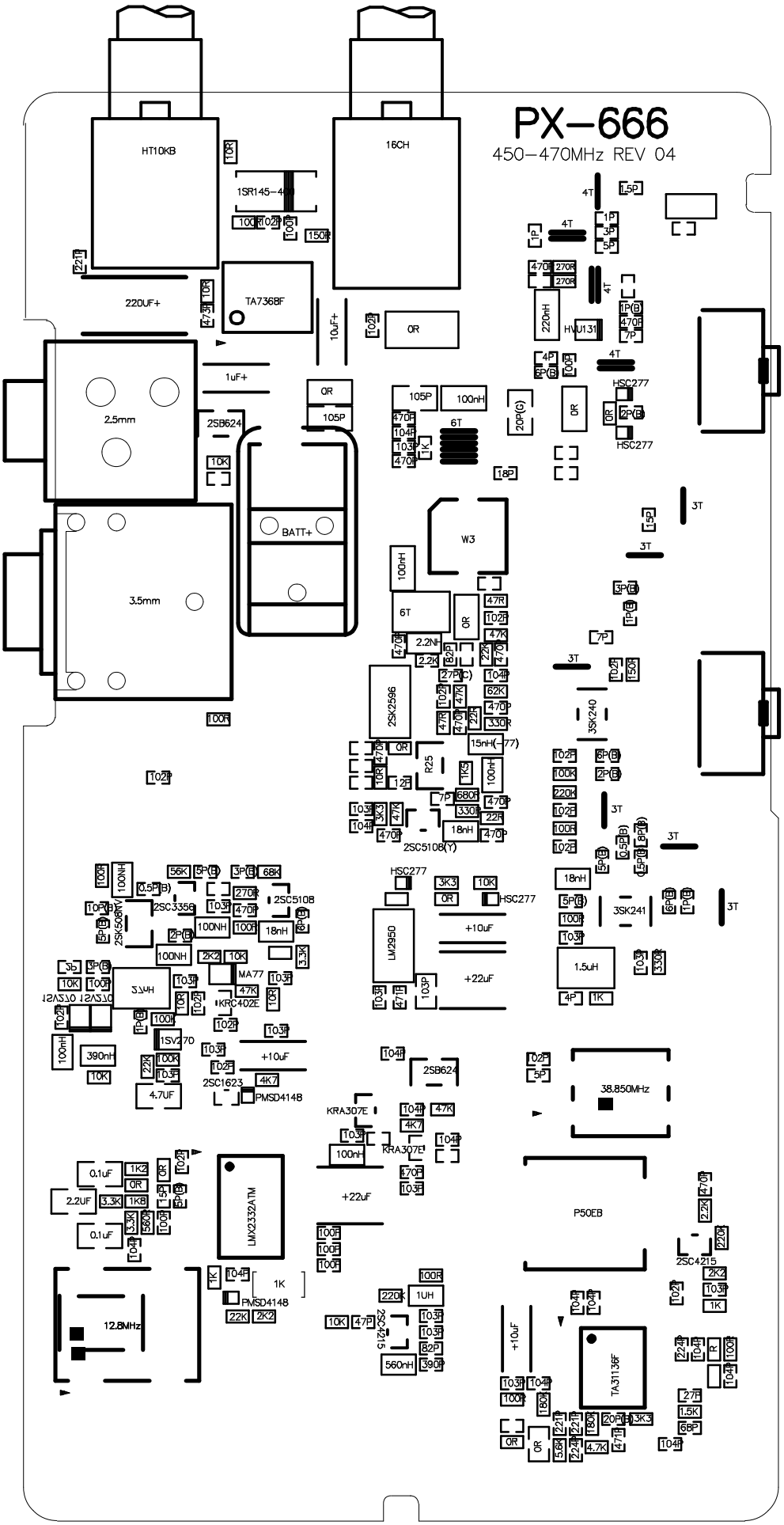
R0402	47K	7	R126						
R0402	51K	1	R185						
R0402	56K	1		R322					
R0402	62K	1	R117						
R0402	68K	1	R342						
R0402	82K	1	R903						
R0402	100K	6	R603	R904	R881	R306	R303	R201	
R0402	150K(F)	7	R173	R171	R170	R174	R175	R172	
			R882						
R0402	120K	1	R455						
R0402	180K	2	R243	R241					
R0402	220K	6	R181	R286	R433	R203	R232	C251	
R0402	680K	1	R606						
R0402	1M	1	R183						
R0402	1M8	2	R633	R623					
R0805	0R	3	R123	L801	R127				
R1206	0.36R	3	R132	R131	R130				
IC									
TSSOP20	LMX2332ATM	1	U401						
SOP8	24C08	1	U911						
SOP8	NJM4558	1	U601						
SSOP10-P-225	TA7368F	1	U621						
SSOP8	LM2904V	1	U170						
MIP16	TA31136F	1	U240						
DYNATRON									
T_ESM	2SC1623	1	T323						LY
T_ESM	2SC4617(S)	2	T621	T339					
T_ESM	DAN222	1	D602						
T_ESM	KRC402E	4	T822	T821	T812	T311			
T_ESM	KRA307E	1	T861						
T_SOT89	5V	1	U831						
T_TSM	2SB624	3	T901	T871	T811				BV4
T_TSM	2SC3356	1	T102						
T_TSM	2SK508NV	1	T321						
T_USM	MRF497	1	T601						L17
T_USM	1SS372	1	D601						BAT54SW
T_USM	KRC402E	2	T171	T181					
T_USM	KRA302E	1	T240						
T_USM	2SC4215	2	T230	T431					T34
T_USM	KRA307E	1	T851						
T_USM	2SC5108(Y)	2	T101	T341					
T_USM	2SC4226	1	T322						
	W3	1	T107						POW TR
T_USM	2SK1824	1	T641						
SOT24	3SK241	2	T202	T201					3SK177

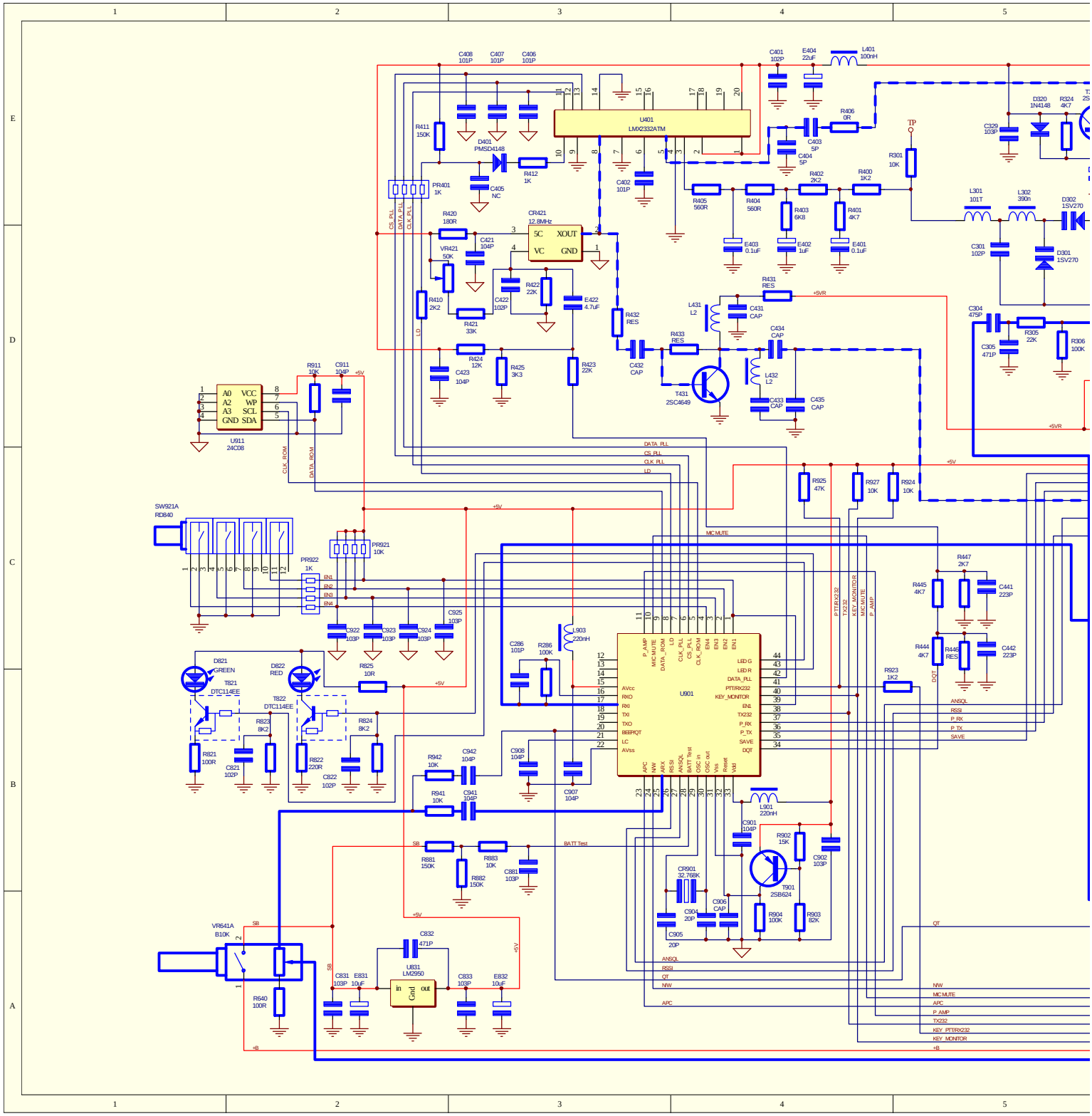
SOT89	2SK3078	**1**	T105						
COIL									
T3X15X040	3T	**6**	L207	L206	L205	L204	L203	L202	
T4X15X040	4T	**4**	L110	L112	L113	L114			
T8X15X040	6T	**2**	L106	L104					
TUNMER									
VR1208	10K	**1**	VR451						
VR1208	50K	**1**	VR421						
CRYSTAL									
CR_DS0305	12.8MHz	**1**	CR421						
CR_DS0603	32.768KHz	**1**	CR901						
CR_DS6055	38.850MHz	**1**	FL230						
OTHER									
ANKEY1		**2**	SW923	SW922					PTT
SW-CH	16CH	**1**	SW921						SW-CH
SW-VR	HT10KB	**1**	VR641B						SW-VOL
SRP8	1K	**2**	PR922	PR401					
SRP8	47K	**1**	PR921						
PHONE2.5A	2.5mm	**1**	JK601						
PHONE3.5A	3.5mm	**1**	JK621						
MIC6.0	MIC	**1**	MIC601						MIC
C28	C28	**1**	CR241						
LTUPC455	P50EB	**1**	FL240						
QFP44	78P451SAQ	**1**	U901						

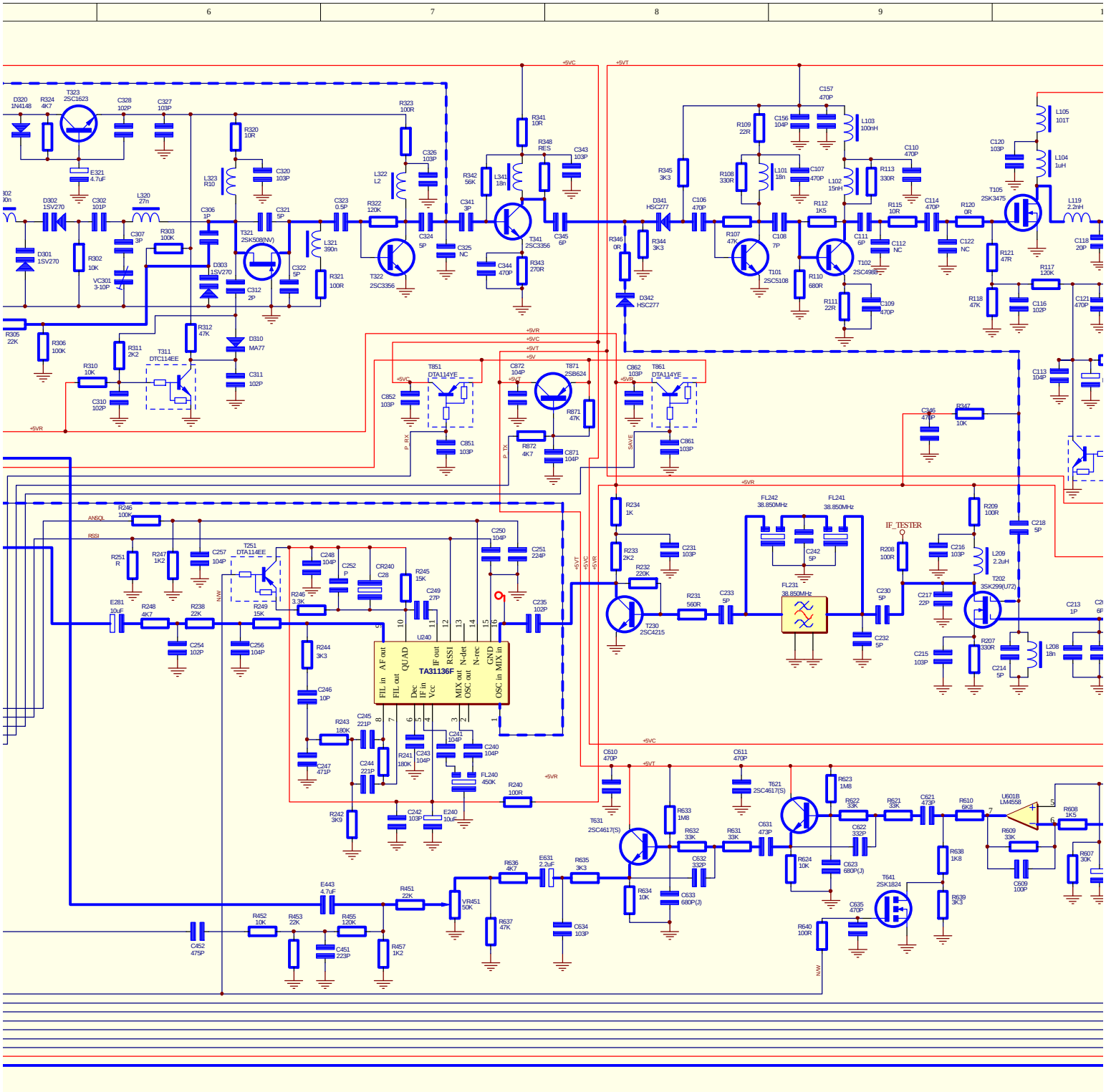
Block diagram

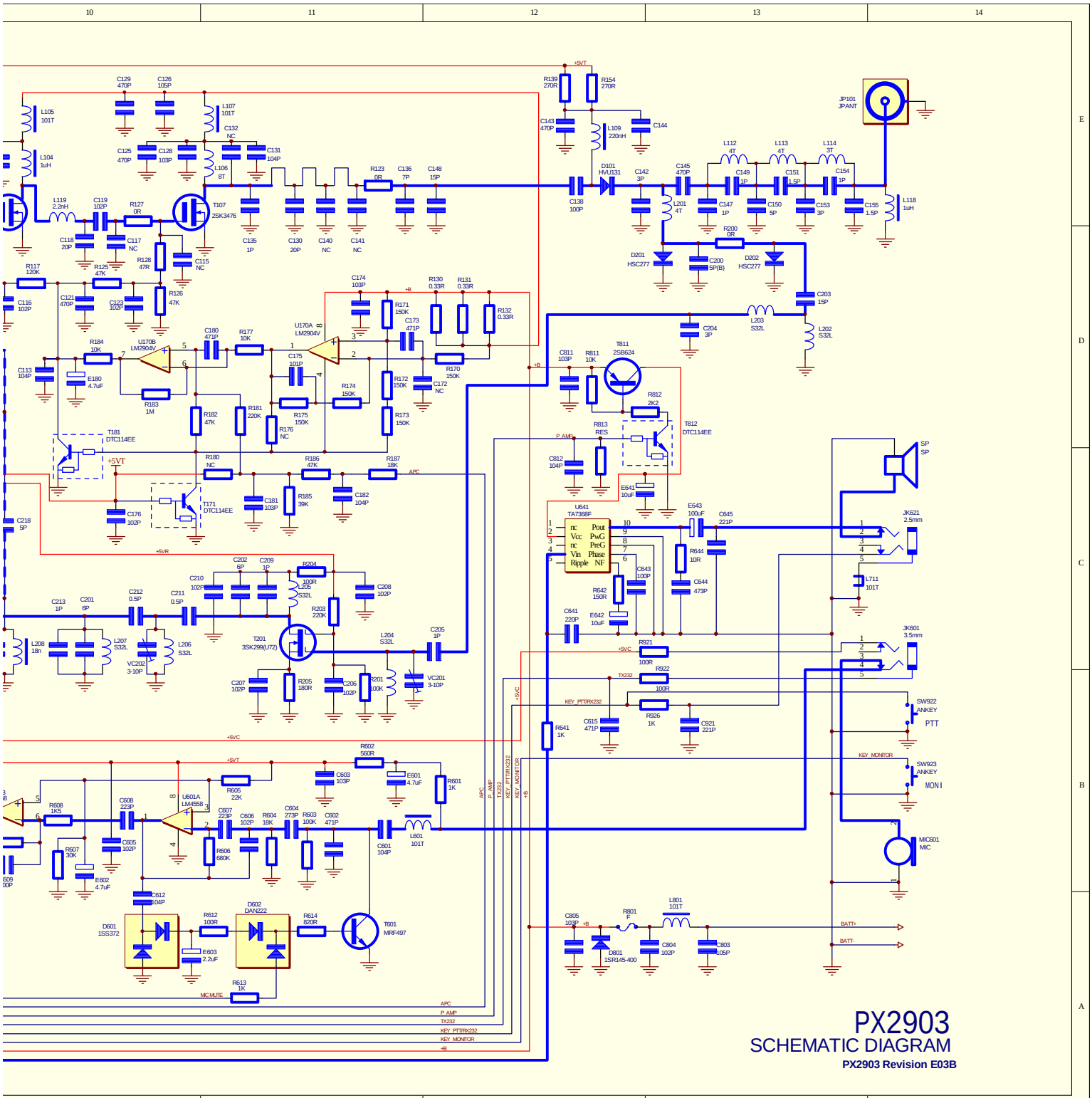



PX-666
450-470MHz REV 04
(TB-)Hut
RED
GREEN
10R
KRC402E
KRC402E
0.36R
0.36R
0.36R
105P
BATT
LM2904V
SPEAKER
100nH
+10uF
4.7uF
NJM4558
2SC4617(S)
2SC4617(S)
UHF
CV
24C08
ANSQL
RSSI
DEV
32.768KHz
2SB624
10uF+


PX-666
450-470MHz REV 04
HT10KB
16CH
TA7368F
220UF+
1uF+
10uF+
2.5mm
3.5mm
BATT+
2SB624
W3
2SK2596
2SC5108(Y)
3SK240
3SK241
HSC277
LM2950
1.5uH
2SC3356
MA77
KRC402E
KRA307E
1SV270
2SC1623
PMSD4148
LMX2332ATM
12.8MHz
38.850MHz
P50EB
TA31136F
2SC4215


U401
LM2332ATM
U901
U911
24C08
U831
LM2950
T431
2SC4649
T901
2SB624
CR421
12.8MHz
SW921A
RDB40
VR641A
B10K
VR421
50K
PR401
1K
PR921
10K
PR922
1K
D401
PMSD4148
D821
GREEN
D822
RED
T821
DTC114EE
T822
DTC114EE
D320
1N4148
D302
1SV270
D301
1SV270
TP
L401
100nH
L301
101T
L302
390n
L901
220nH
L903
220nH
C401
102P
E404
22uF
C408
101P
C407
101P
C406
101P
C403
5P
C404
5P
C405
NC
C402
101P
C329
103P
C301
102P
C304
475P
C305
471P
C431
CAP
C432
CAP
C433
CAP
C434
CAP
C435
CAP
C421
104P
C422
102P
C423
104P
E422
4.7uF
E403
0.1uF
E402
1uF
E401
0.1uF
C821
102P
C822
102P
C832
471P
C831
103P
E831
10uF
C833
103P
E832
10uF
C922
103P
C923
103P
C924
103P
C925
103P
C908
104P
C907
104P
C942
104P
C941
104P
C901
104P
C902
103P
C881
103P
C904
20P
C905
20P
C906
CAP
C441
223P
C442
223P
C911
104P
C286
101P
R411
150K
R412
1K
R420
180R
R421
33K
R422
22K
R423
22K
R424
12K
R425
3K3
R431
RES
R432
RES
R433
RES
R405
560R
R404
560R
R406
0R
R403
6K8
R402
2K2
R401
4K7
R400
1K2
R301
10K
R410
2K2
R911
10K
R825
10R
R821
100R
R822
220R
R823
8K2
R824
8K2
R942
10K
R941
10K
R881
150K
R882
150K
R883
10K
R902
15K
R904
100K
R903
82K
R640
100R
R325
47K
R927
10K
R924
10K
R923
1K2
R329
1K2
R305
22K
R306
100K
R445
4K7
R444
4K7
R447
2K7
R446
RES
R286
100K
CR901
32.768K
L431
L2
L432
L2
DATA_PLL
CS_PLL
CLK_PLL
LD
MIC.MUTE
+5V
+5VR
+B
SB
QT
ANSQL
RSSI
NW
APC
P_AMP
TX232
KEY_PTT/RX232
KEY_MONITOR
P_RX
P_TX
SAVE
DQT
BATT.Test


6
7
8
9
TA31136FT
IF_TESTER
+5VC
+5VT
+5VR
+5V
ANSQL
RSSI
P_RX
P_TX
S-M/E
N-W


10
11
12
13
14
A
B
C
D
E
PX2903
SCHEMATIC DIAGRAM
PX2903 Revision E03B